

CLAIMS

1. Process for producing an absorbent polymer structure (Pa) by treating the outer
5 portion of an untreated absorbent polymer structure (Pu1), comprising the steps:
 - bringing the outer portion of the untreated absorbent polymer structure (Pu1) into contact with an aqueous solution containing at least one chemical cross-linker and at least one inorganic compound in dispersed
10 colloidal form;
 - heating the absorbent polymer structure, of which the outer portion has been brought into contact with the aqueous solution, at a temperature in the range from 40 to 300°C, so that the outer portion of the absorbent polymer structure is more strongly cross-linked compared to the inner portion and
15 the inorganic compound is at least partly immobilised in the outer portion of the absorbent polymer structure.
2. Process for producing an absorbent polymer structure (Pa) by treating the outer
portion of an absorbent polymer structure (Pu2), that has not been treated with
an inorganic compound in dispersed colloidal form, comprising the steps:
 - 20 - bringing the outer portion of the absorbent polymer structure (Pu2) into contact with an aqueous solution containing at least one chemical cross-linker and at least one inorganic compound in dispersed colloidal form;
 - heating the absorbent polymer structure, of which the outer portion has been brought into contact with the aqueous solution, at a temperature in the
25 range from 40 to 300°C, so that the outer portion of the absorbent polymer structure is more strongly cross-linked compared to the inner portion and the inorganic compound is at least partly immobilised in the outer portion of the absorbent polymer structure.
3. Process according to claim 1 or claim 2, wherein the absorbent polymer
30 structure (Pu1) or (Pu2) is based on:

- ($\alpha 1$) 20-99.999 wt.% of polymerised, ethylenically unsaturated, acidic group-containing monomers or salts thereof or polymerised, ethylenically unsaturated monomers containing a protonated or a quaternary nitrogen, or mixtures thereof,
- 5 ($\alpha 2$) 0-80 wt.% of polymerised, monoethylenically unsaturated monomers which can be co-polymerised with ($\alpha 1$),
- ($\alpha 3$) 0.001-5 wt.% of one or more cross-linkers,
- ($\alpha 4$) 0-30 wt.% of a water soluble polymer, as well as
- ($\alpha 5$) 0-20 wt.% of one or more additives,
- 10 wherein the sum of the component weights ($\alpha 1$) to ($\alpha 5$) amounts to 100 wt.%.
4. Process according to one of the preceding claims, wherein the absorbent polymer structure (Pu1) or (Pu2) has at least one of the following properties:
- (A) the maximum absorption of 0.9 wt.% NaCl solution is within a range from at least 10 to 1000 g/g.
- 15 (B) the part extractable with 0.9 wt.% aqueous NaCl solution amounts to less than 30 wt.%, based on the absorbent polymer structure (Pu1) or (Pu2),
- (C) the bulk density is within a range from 300 to 1000 g/l,
- (D) the pH value for 1 g of the absorbent polymer structure (Pu1) or (Pu2) in 1 l water is within a range from 4 to 10,
- 20 (E) the CRC value is within a range from 10 to 100 g/g.
5. Process according to one of the preceding claims, wherein the absorbent polymer structure (Pu1) or (Pu2) is brought into contact with at most 20 wt.% of the aqueous solution, based on the weight of the absorbent polymer structure (Pu1) or (Pu2).
- 25 6. Process according to one of the preceding claims, wherein two separate aqueous solutions, of which one contains the chemical cross-linker and the other the inorganic compound in dispersed colloidal form, are brought simultaneously into contact with the absorbent polymer structure (Pu1) or (Pu2).

7. Process according to one of the preceding claims, wherein at least 30 wt.% of the inorganic compound in the aqueous solution, with which the outer portion of the absorbent polymer structure (Pu1) or (Pu2) is brought into contact, comprises particles with a particle size within a range from 1 to 100 nm.
- 5 8. Process according to one of the preceding claims, wherein the inorganic compound is used in an amount from 0.001 to 10 wt.% based on the absorbent polymer structure (Pu1) or (Pu2), in the treatment of the outer portion of an absorbent polymer structure (Pu1) or (Pu2).
9. Process according to one of the preceding claims, wherein particles comprising
10 polysilicic acid are used as inorganic compound.
10. Process according to one of the preceding claims, wherein a condensation cross-linker is used as the chemical cross-linker.
11. Absorbent polymer structure (Pa), obtainable by a process according to one of claims 1 to 10.
- 15 12. Absorbent polymer structure (Pa), comprising an inner portion as well as an outer portion surrounding the inner portion, wherein the outer portion is more strongly cross-linked than the inner portion, an inorganic compound is at least partly immobilised in the outer portion and wherein the absorbent polymer structure (Pa) has at least one of the following properties:
 - 20 (β1) for a CRC <26 g/g a SFC of at least $80 \cdot 10^{-7} \text{ cm}^3 \cdot \text{s} \cdot \text{g}^{-1}$,
 - (β2) for a CRC within the range ≥ 26 to <27 g/g a SFC of at least $70 \cdot 10^{-7} \text{ cm}^3 \cdot \text{s} \cdot \text{g}^{-1}$,
 - (β3) for a CRC within the range ≥ 27 to <28 g/g a SFC of at least $60 \cdot 10^{-7} \text{ cm}^3 \cdot \text{s} \cdot \text{g}^{-1}$,
 - 25 (β4) for a CRC within the range ≥ 28 to <29 g/g a SFC of at least $45 \cdot 10^{-7} \text{ cm}^3 \cdot \text{s} \cdot \text{g}^{-1}$,
 - (β5) for a CRC within the range ≥ 29 to <30 g/g a SFC of at least $30 \cdot 10^{-7} \text{ cm}^3 \cdot \text{s} \cdot \text{g}^{-1}$,
 - (β6) for a CRC within the range ≥ 30 to <31 g/g a SFC of at least $20 \cdot 10^{-7} \text{ cm}^3 \cdot \text{s} \cdot \text{g}^{-1}$,
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(β7) for a CRC within the range ≥ 31 g/g a SFC of at least $10 \cdot 10^{-7}$ $\text{cm}^3 \cdot \text{s} \cdot \text{g}^{-1}$.

13. Absorbent polymer structure (Pa) according to claim 12, wherein the absorbent polymer structure has an Absorbency against Pressure (AAP) of at least 18 g/g under a pressure of 50 g/cm^2 .
14. Absorbent polymer structure (Pa) according to one of claims 12 to 13, wherein the inorganic compound is a condensate of polysilicic acids.
15. Composite, comprising an absorbent polymer structure (Pa) according to claim 11 or 12 and a substrate.
16. Process for producing a composite, wherein an absorbent polymer structure (Pa) according to claim 11 or 12 and a substrate and optionally an additive are brought into contact with each other.
17. Composite obtainable by a process according to claim 16.
18. Chemical products, comprising the absorbent polymer structure (Pa) according to claim 11 or 12 or the composite according to claim 15 or 17.
19. Use of the absorbent polymer structure (Pa) according to claim 11 or 12 or of the composite according to claim 15 or 17 in chemical products.
20. Aqueous solution containing at least one chemical cross-linker and at least one inorganic compound in dispersed colloidal form.
21. Process for producing an aqueous solution according to claim 20, wherein an aqueous solution containing at least one inorganic compound in dispersed colloidal form is mixed with at least one chemical cross-linker.
22. Process according to claim 21, wherein the chemical cross-linker is used in the form of an aqueous solution.
23. An aqueous solution obtainable by a process according to claim 21 or 22.
24. An aqueous solution according to claim 20 or 23, wherein the inorganic compound is in the form of particles comprising polysilicic acid.
25. Use of the aqueous solution according to claim 20 or 23 in the treatment of the outer portion of an untreated absorbent polymer structure (Pu1).

26. Use of the aqueous solution according to claim 20 or 23 in the treatment of the outer portion of an absorbent polymer structure (Pu2), that has not been treated with an inorganic compound in dispersed colloidal form.
27. Use of the aqueous solution according to claim 20 or 23 in the tuning of at least one of the following properties of an untreated absorbent polymer structure (Pu1):
- (γ1) Saline Flow Conductivity (SFC),
 - (γ2) Centrifugation Retention Capacity (CRC) or
 - (γ3) Absorbency against Pressure (AAP).
28. Use of the aqueous solution according to claim 20 or 23 in the tuning of at least one of the following properties of an absorbent polymer structure (Pu2), that has not been treated with an inorganic compound in dispersed colloidal form:
- (γ1) Saline Flow Conductivity (SFC),
 - (γ2) Centrifugation Retention Capacity (CRC) or
 - (γ3) Absorbency against Pressure (AAP).